Saturday, August 28, 2021
9:56 AM

Assessment

The statement $p \rightarrow q$ is called a conditional statement because $p \rightarrow q$ asserts that q is true on the condition that p holds. A conditional statement is also called an **implication**.

The truth table for the conditional statement $p \rightarrow q$ is shown in Table 5. Note that the statement $p \rightarrow q$ is true when both p and q are true and when p is false (no matter what truth value q has).

Because conditional statements play such an essential role in mathematical reasoning, a variety of terminology is used to express $p \rightarrow q$. You will encounter most if not all of the following ways to express this conditional statement:

- "if p, then q"
- "if p, q"
- "p is sufficient for q"
- "q if p"
- "q when p"
- "a necessary condition for p is q"
- "q unless $\neg p$"
- "p implies q"
- "p only if q"
- "a sufficient condition for q is p"
- "q whenever p"
- "q is necessary for p"
- "q follows from p"

① $f(x)$ is cont. follows from $f(x)$ is diffable

② " " diffable " " " " " cont.

q follows from p

p: $f(x)$ is diff.able. $p \rightarrow q$ $q \not\Rightarrow p$ $f(x) = |x|$ at $x=0$

q: " " cont.

$p \rightarrow q$

(a) (1) $f(x)$ is cont. unless $f(x)$ is not diff.able — q unless ~p

(b) (2) " " diff.able " " " " " cont.

p $\rightarrow$ q

If you study hard then you get a good job

(a) You get good job unless you don't study hard.

(b) You study hard unless you don't get a good job.

Let p be the statement "Maria learns discrete mathematics" and q the statement "Maria will find a good job." Express the statement p → q as a statement in English

(1) If Maria learns DM, then Maria will find a good job.

(2) Maria will find a good job when(ever) Maria learns DM

(3) For Maria to get a good job it is Suff ~~Nec.~~ that Maria learns DM.

p → q For 'q' p is suff.

(a) Necessary (b) Suff.

$p \to q$ For 'q', p is suff.

For 'q', p is Nec.

① Maria will find a good job unless she doesn't learn DM.

② Maria learns DM unless she will not find a good job.

Contrapositive, Converse, Inverse of a Conditional Statement

$p \to q$ Contrapositive of $p \to q$ is $\sim q \to \sim p$

$q \to p$ Converse of $p \to q$ is $q \to p$

Inverse of $p \to q$ is $\sim p \to \sim q$

p: f(x) is diffable $p \to q$ If f(x) is not cont. then f(x) is not diff. able.

q: " " cont. $q \to p$

$\sim q \to \sim p$

p	q	$p \to q$	$\sim q$	$\sim p$	$\sim q \to \sim p$
T	T	T	F	F	T
T	F	F	T	F	F
F	T	T	F	T	T
F	F	T	T	T	T

What are the contrapositive, the converse, and the inverse of the conditional statement "The home team wins whenever it is raining?

$p \to q$ p: It is raining

q: Home teams wins.

q whenever p

$p \to q$ $\sim q \to \sim p$

If it is raining then the home team wins.

q: If it is raining then the home team wins.

Contrapositive: If home team doesn't win then it is not raining.

Converse: If home team wins then it is raining.

Inverse: If it is not raining then the home team doesn't win.